

TORNADO OF MAY 24, 1927, AT ST. JOSEPH, MO.

By W. S. BELDEN

A tornado advanced in an easterly direction through St. Joseph, Mo., from the Missouri River, beginning at about 5:18 a. m. on the 24th. Its destructive path was approximately two blocks wide, but not continuous. Much of the greater part of the destruction to property was in a business portion of the city from Third and Sylvania Streets nearly due east to High School Hill. Within this distance of two-thirds of a mile many large buildings were seriously damaged, roofs and walls being destroyed. After passing over the hill the course of the tornado was to the southeastward, with considerable damage for several blocks in the residential district, beginning at Sixteenth and Olive Streets. Then after another interval of about half a mile, with only slight damage, the tornado blew down many valuable trees in Bartlett Park, after which it lost energy. For about half a mile on either side of the immediate path of the storm high winds caused considerable damage to shade trees, chimneys, etc.

At the weather observatory, about half a mile north of the path of the storm, the wind attained an extreme velocity of 78 miles an hour from the northwest at 5:18 a. m. This record has been equaled only once since the establishment of the weather station in this city in 1910. For several hours preceding the tornado the temperature ranged from 71 to 68, the wind was light from the southwest, south, and east, and the barometer fell slightly, with reading reduced to sea level, approximately 29.71 inches, for more than two hours preceding the storm. At the time of the passage of the tornado the barometer fell slightly and then rose abruptly 0.07 inch. Excessive rainfall for nine minutes, beginning at 5:18 a. m., amounted to 0.42 inch. Thunder and lightning accompanying the storm were moderate.

Two persons were slightly injured and none killed. A conservative estimate of property damage, made by the city engineer, was placed at about \$200,000.

RAIN-BEARING WINDS IN THE FAR WESTERN STATES

By THOMAS R. REED

In "Weather Forecasting in the United States" (3) Henry says: "A simple and very general rule for forecasting the weather in the Pacific Coast States is 'southerly winds bring rain; northerly, fair weather' " (p. 119). Probably all meteorologists, in fact all attentive observers of weather phenomena on the Pacific slope, will concur. So infallible appears the operation of this rule and so extensive is the territory over which it holds sway that desire is naturally aroused to determine the actual proportion of cases to which it applies and to define, and if possible explain the exceptions to it, both for the area in general and for particular regions within it. A practicable way of accomplishing this object was suggested by Von Herrmann's paper entitled "The Rain-Bearing Winds of Atlanta, Ga." (1), in which rainfall percentages were diagrammatically represented for each of the eight compass points and for the various months of the year. Weather Bureau stations of the first order within the San Francisco forecast district, which comprises the States of Washington, Oregon, California, Nevada, and Idaho, were asked to contribute these statistics for the 10-year period 1916-1925, and graphic representations developed from their tabulations are reproduced herewith. The only station submitting data based on a shorter period was Spokane, where only 5 years' record was available. Diagrams for each of the 21 stations and for each of the 12 months have been drawn after the Von Herrmann plan, although involving a somewhat dissimilar development of the data.

While diagrams for all the months reveal facts of interest, those portraying the rain-bearing winds of the wet season are most significant. It is evident that due to the shortness of the period for which means were computed, only the data for the rainy season can be relied upon for conclusions. Rainfall during the dry season is so infrequent and relatively so light that, to be representative, means would have to be obtained from an exceedingly long period of observations; longer, in all probability, than any offered by available records. This fact should be borne in mind while inspecting the diagrams, as otherwise very imperfect impressions may result. To cite one case in which this defect is well

illustrated, take the San Luis Obispo figures for the nearly rainless month of June. The percentages show northwest to be the rainiest quarter, but inspection of the detailed record reveals the inadequacy of the data, as during the 10-year period there was a total rainfall of only 0.24 inch for all directions, of which 0.08 inch happened to occur while the wind was in the northwest. Another example is furnished by the San Jose table. In this case the meteorologist who supplied the data sought to modify the obvious inconsistency of the dry-season percentages by extending the record to include a 20-year period, and yet we find the maximum rainfall in July occurring with a northwest, or fair weather, wind. Here the limitations of even a 20-year mean for the dry months are clearly illustrated, since the detailed record for July contains a 20-year total of only 0.11 inch, of which 0.08 inch fell during the time the wind was northwest. Similar defects could be pointed out in most of the tables so far as summer conditions are concerned, although the errors become less egregious as we go north along the coast and the amount of summer rainfall proportionately increases.

Obviously, too, with so pronounced a dry season it was impracticable to follow Von Herrmann's method of computing percentages on the basis of annual means and percentages based on monthly means were employed in preference. It was thought that labor would be lessened without material sacrifice of accuracy if station normals for the various months were used instead of actual means for the 10-year period, and most of the station officials made their computations in this way; but a few, feeling that the results thus obtained were misleading, computed means for the particular period involved and secured percentages therefrom. Emphasis must be given to the fact that the percentages refer to the amount of precipitation and not to frequency of its occurrence.

The outstanding fact established by the tables and diagrams is the preponderance of precipitation with south winds. The most casual scrutiny of the data makes this plain. At some stations there are strong southeast and southwest components, and at a few stations one or the other of these components exceeds the southerly